

A GEOLOGICAL HISTORY OF DEVONSHIRE.¹

THE title of this book requires some explanation, for the subject-matter is not a description of the existing scenery of Devon, or of the manner in which its various features have been developed out of the rock-surfaces which last rose above the sea. It is mainly a description of the physical and geographical conditions under which the rocks of the south-west of England were formed; it is an endeavour (as indicated by the subtitle) to follow the geographical evolution of the region, and to picture the successive stages in the development of its physical geography.

The aim of the author has evidently been to present what is known of the geological history of Devonshire in as interesting a form as possible; hence, as stated in the preface, he has used "the minimum of tech-

Devon begins to be readable from its own records," this, of course, being the Devonian period. Having first indicated the probable geography of Britain at this time, the author describes the rocks of North Devon, indicating the great compression and contortion to which they have been subjected. He mentions the diverse views which have been held regarding their succession, and wisely remarks that further investigation is required before this matter can be settled.

The next chapter is devoted to the Devonian of South Devon, of which a good description is given, with a glance at the schistose area of the Start, laying stress on the fact that the results of compression and metamorphism become greater in the direction of these crystalline rocks. It was perhaps to be expected that he would repeat the statement that the

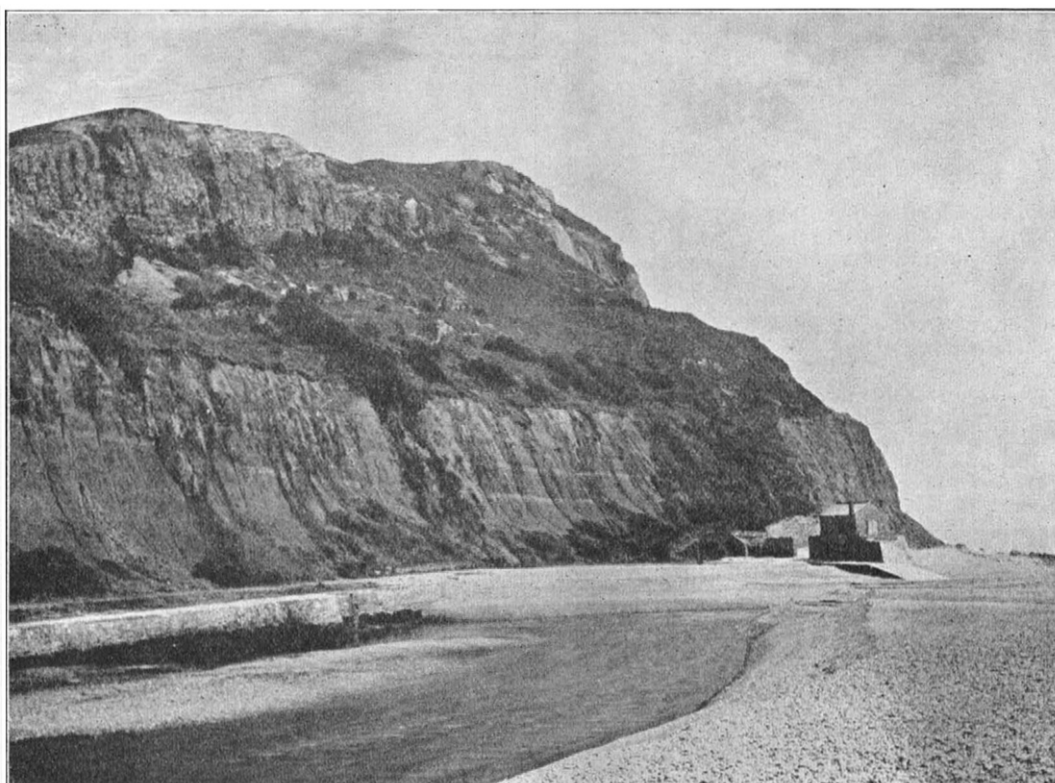


FIG. 1.—The Haven Cliff, Axmouth. Greensand on eroded surface of Keuper Marls. From "The History of Devonshire Scenery"

nical language with the object of making them (his pages) suitable for the beginner and the ordinary reader who has no previous knowledge of the subject, but who cares to know how Devonshire came to be what it is."

Moreover, he has contrived to include much general information regarding the rocks of the British Islands, and since many modern geologists consider that professorial teachers of geology have dwelt too much on the lithological and structural branches of the science, and too little on its connections with physical geography, such a book as this ought to find a welcome in many quarters.

After an introductory chapter devoted to "Protozoic" time, "we reach the date when the history of

Devonian limestones are essentially of coralline origin, and are to be regarded as ancient coral-reefs, for he could quote a recent Geological Survey memoir to that effect. Nevertheless, its truth has more recently been questioned, and it has been shown that large parts of the limestone are crinoidal, while others are chiefly made up of Stromatoporoids; moreover, we do not know whether any Palæozoic corals were reef-builders.

In chapter vi. we find a general account of the Carboniferous rocks before coming to those of Devon, the description of which is not very satisfactory, because it is entirely based on the old view that the Coddon Hill cherts overlies the limestones, and that the whole group represents the lowest part of the Carboniferous Limestone of Bristol and South Wales; whereas good reasons were given by Dr. W. Hind in 1904 for placing the cherts below the limestones, and for regarding both as the equivalents of the Pendleside

¹ "The History of Devonshire Scenery—An Essay in Geographical Evolution." By A. W. Clayden. Pp. 202; with 41 photographic illustrations and some diagrams. (Exeter: J. G. Commin; London: Chatto and Windus, 1906.) Price 10s. 6d. net.

beds which overlie the great mass of the midland Carboniferous Limestone.

For the next two chapters we have nothing but commendation. They deal with the time represented by the great gap between the Culm and the Permian rocks. The first is entitled "The Great Upheaval," and gives a clear and sufficient account of the post-Carboniferous mountain-ranges which are known as the Hercynian or Armorican system, and of the subsidiary Pennine range. This is illustrated by a restoration of the physical geography of the British area at this time. The succeeding chapter is devoted to volcanic rocks, with especial regard to the Carboniferous and post-Carboniferous volcanoes.

In the discussion of the Dartmoor granite in chapter vii. the author is faced by a problem which has given rise to many diverse expressions of opinion. He practically adopts the view advocated by the late R. N. Worth, and sets himself to show "that the granite mass of Dartmoor is really the solidified upper part of the cooled lava reservoir from which the Carboniferous volcanoes of Devon were fed." We think he states the case for this theory with somewhat of over-confidence, for the dissolving of sedimentary rock in the granitic magma is thought by some to be very improbable, and the temperature at which the granite solidified is still a disputed point, while the actual evidence for the existence of volcanoes over the Dartmoor granite is by no means strong. Prominence is, of course, given to the occurrence of peculiar volcanic rocks in the Permian breccias, the origin of which is also dealt with in this chapter.

In the chapter on the "Salt Lake Period" (chapter viii.), an excellent account is given of the Devon Trias and of the conditions under which its successive beds were deposited, the proofs of its salinity and of its barren desert-surroundings being well brought out. The illustrations, too, are especially good, including photographs of "red marl with salt-crystals," "the base of the Budleigh pebble-bed," and "the tea-green marls overlain by the Rhætic bone-bed."

The dawn of Jurassic time and the great climatic change produced by the irruption of the sea into the salt lake are set forth in the opening page of a chapter entitled "The Age of Reptiles." In this the Lias and the Liassic sea are duly described, and the subsequent sequence of Jurassic rocks is briefly indicated, with some remarks on the erosion to which the surrounding land must have been exposed during the whole period, and especially during its closing scenes, when the British area was again upraised, and the sea retreated far to the south and north-east.

Under the title "The Return of the Sea," chapter x. deals with the beginning of the great Cretaceous subsidence. The stratigraphy of the Gault and Greensand is briefly but clearly described, and there are excellent views of the two cliff sections near Seaton Haven cliff and Whitecliff, the former of which we have selected as an example. Then follows a chapter on "The Chalk," in which the peculiar Devon development of an arenaceous Cenomanian overlain by Middle Chalk and a portion of the Upper Chalk is fairly well described. We notice, however, that there is no mention of the "Beer Stone," another Devon speciality, which differs greatly from ordinary chalk and has been largely used as a building stone from Norman times to the present day.

Mr. Clayden appears to be unaware of the views published in the Geological Survey memoir on the

Cretaceous rocks of Britain respecting the physical conditions under which the different parts of the Chalk were accumulated. When, therefore, he observes that the facts "are inconsistent with the idea of a deep sea," and assumes that the Chalk (as a whole!) was formed "in a shallow sea perhaps less than 100 fathoms deep," we can only express our surprise.

Chapters xii. and xiii. deal with Eocene time, describing the "Plateau Gravels" and the Bovey deposits, which latter the author considers to be essentially lacustrine, and to have been formed in "the Bovey lake." Chapter xiv., entitled "The Rivers of Devon," is the most original portion of the book, and we only wish that the author had developed this subject at greater length. When we say that he believes the drainage of the whole of northern and central Devon in early Tertiary time to have been carried off by one great river flowing eastward, it will be obvious that such a supposition raises many interesting questions. We are inclined to regard it as a very probable theory, but undoubtedly its details require fuller consideration than he gives them.

The modern scenery of the county, how it is partly an uncovered Permian surface and partly one carved out of an Eocene peneplain, is briefly described in the



FIG. 2.—The Crown of the Moor: Yes Tor. From "The History of Devonshire Scenery."

final chapter. Dartmoor also comes in for further mention, and its type of scenery is well illustrated, as will be seen from the illustration selected.

In conclusion it may be said that Mr. Clayden has succeeded very well in the accomplishment of his general intention. The book appeals to a much wider circle than the few readers who may be found in Devon and Cornwall. It really treats of the whole of southern England from Dover to Bude, and should be in the hands of all those who are interested in the geology and the physical geography of our southern counties.

THE UNCIVILISED CHILD.¹

"THE explanation is rather artistic than scientific"—so the author admits about what he has written on the origin of the "couvade." It is a way of saying that he has found his explanation does not accord with the facts gathered by anthropologists concerning this custom. Such is the keynote of the

¹ "Savage Childhood: a Study of Kafir Children." By Dudley Kidd. Pp. xvi + 374. (London: Adam and Charles Black, 1906.) Price 7s. 6d. net.